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Parker

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(54) **AGGREGATE REPLACEMENT**

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CPC ***E02B 11/005*** (2013.01)

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CPC E02B 11/00; E02B 11/005
USPC 405/43, 45, 50, 184.4, 46
See application file for complete search history.

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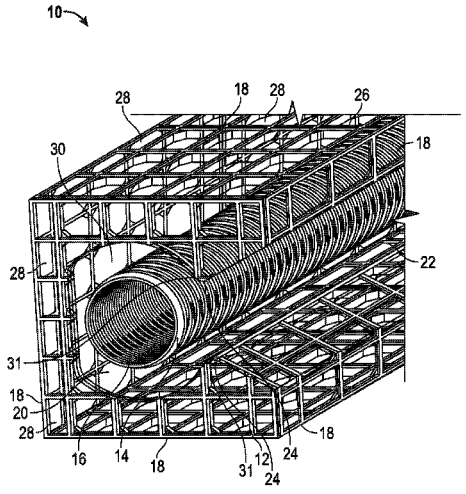
(57) **ABSTRACT**

An aggregate replacement device may be used to take replace rock aggregate in underground drainage systems. An aggregate replacement device may include a structure having a proximal end, a distal end, and at least one face. The at least one face may have a plurality of first openings. A second opening in the structure may extend from the proximal end to the distal end of the structure continuing uninterrupted through at least one of the at least one faces. The second opening may receive a pipe inserted in a radial direction of the pipe. The aggregate replacement device may also include a pipe retainer. An additional embodiment of the aggregate replacement device may include a stake which may be used to secure the aggregate replacement device in position.

15 Claims, 8 Drawing Sheets



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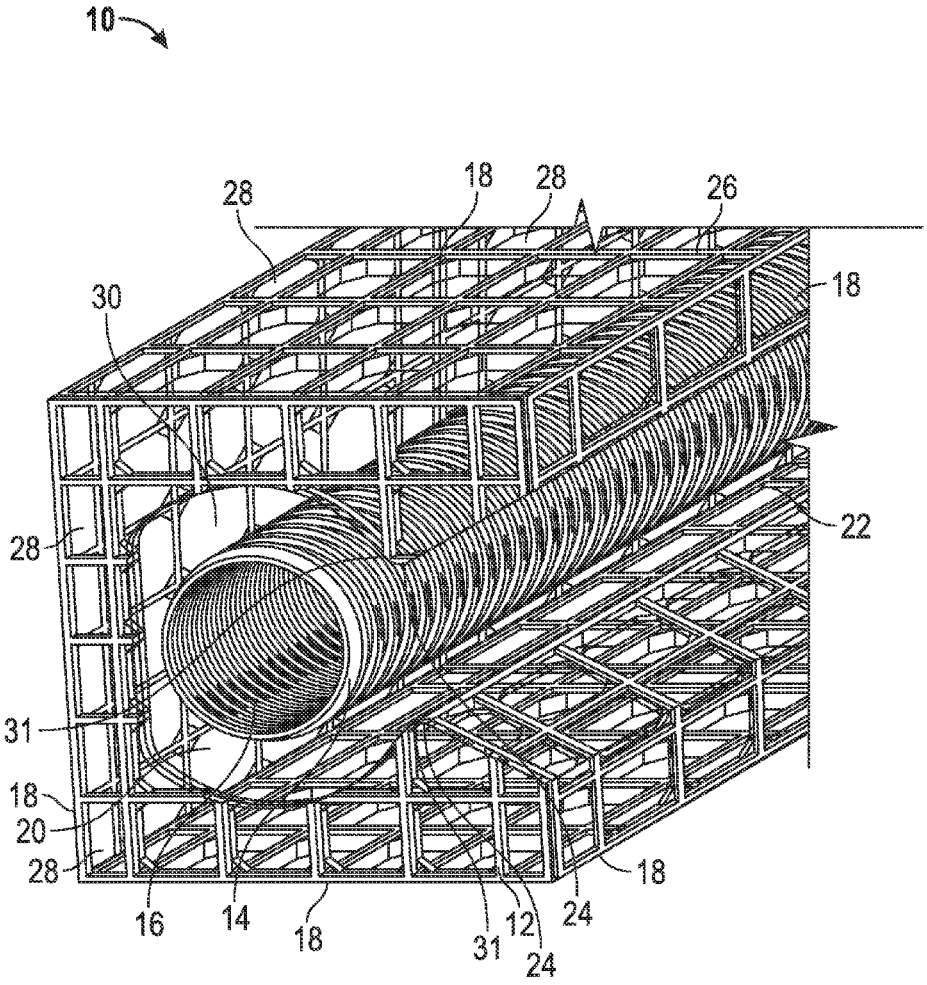

FIG. 1

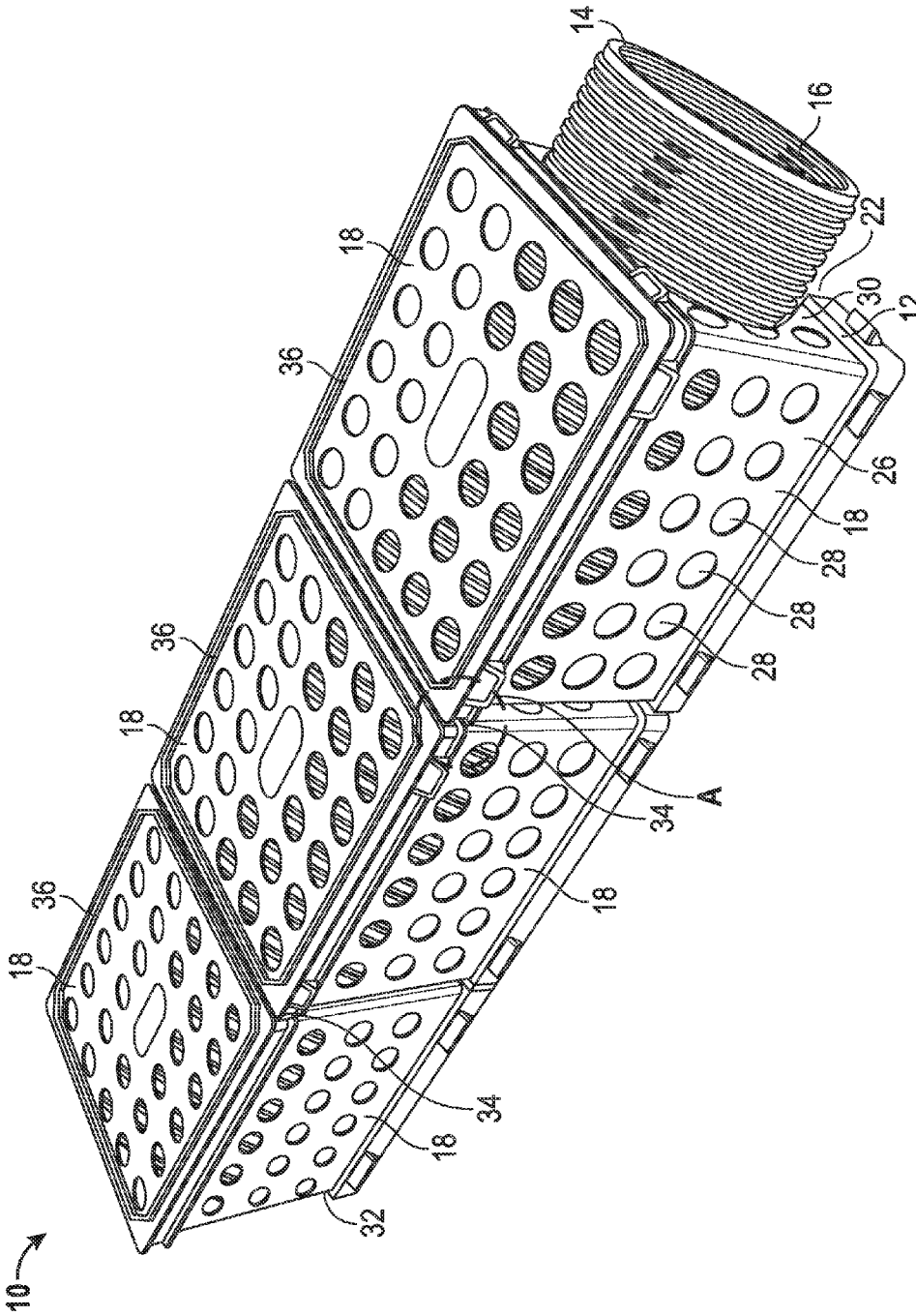

FIG. 2

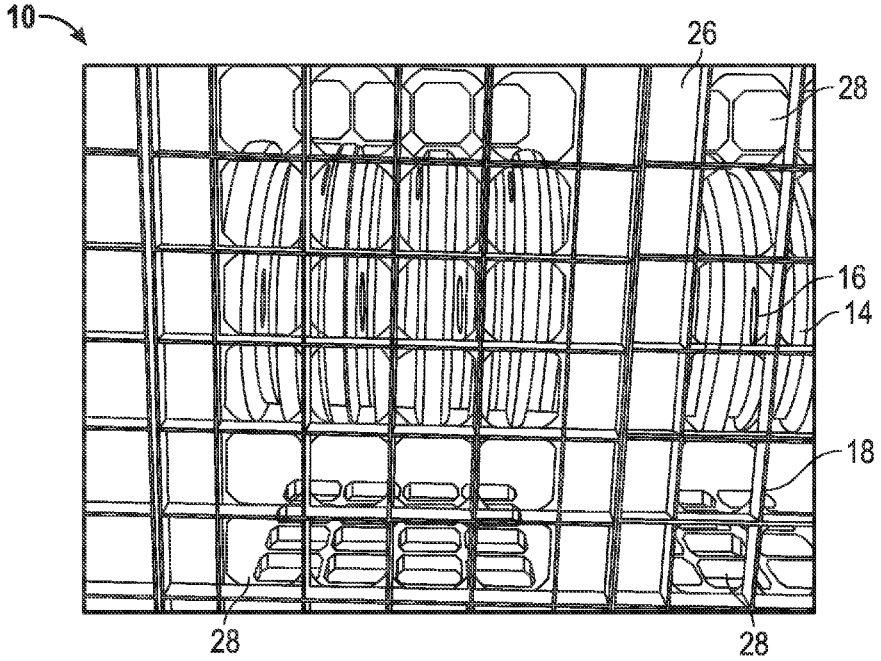

FIG. 3

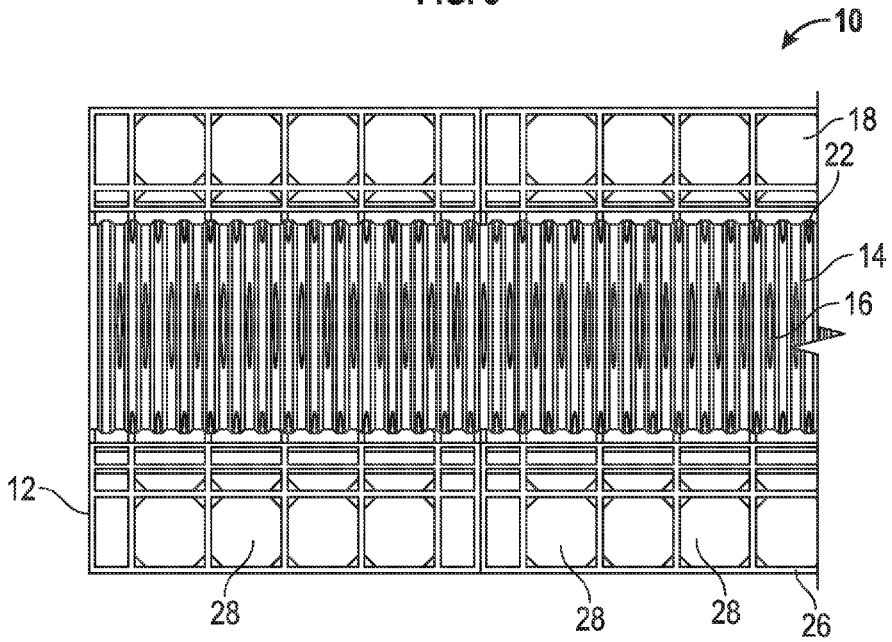

FIG. 4

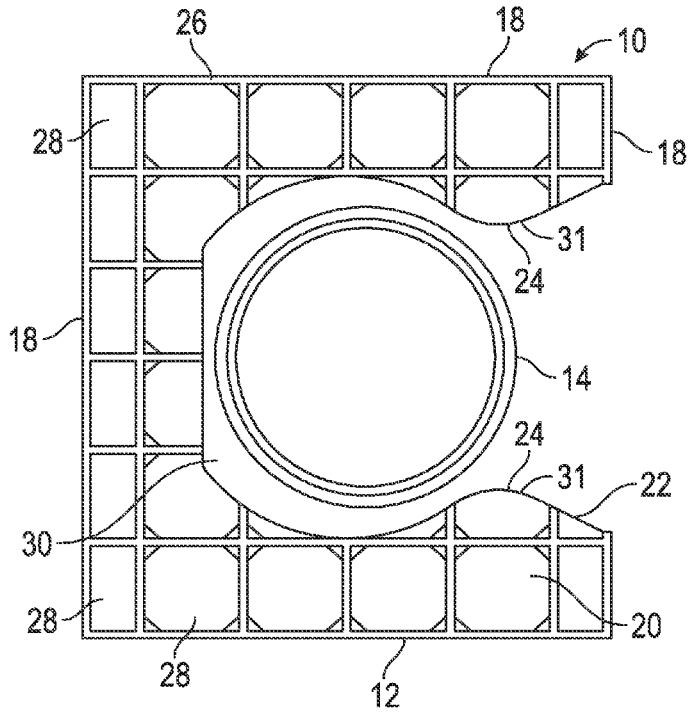
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FIG. 5

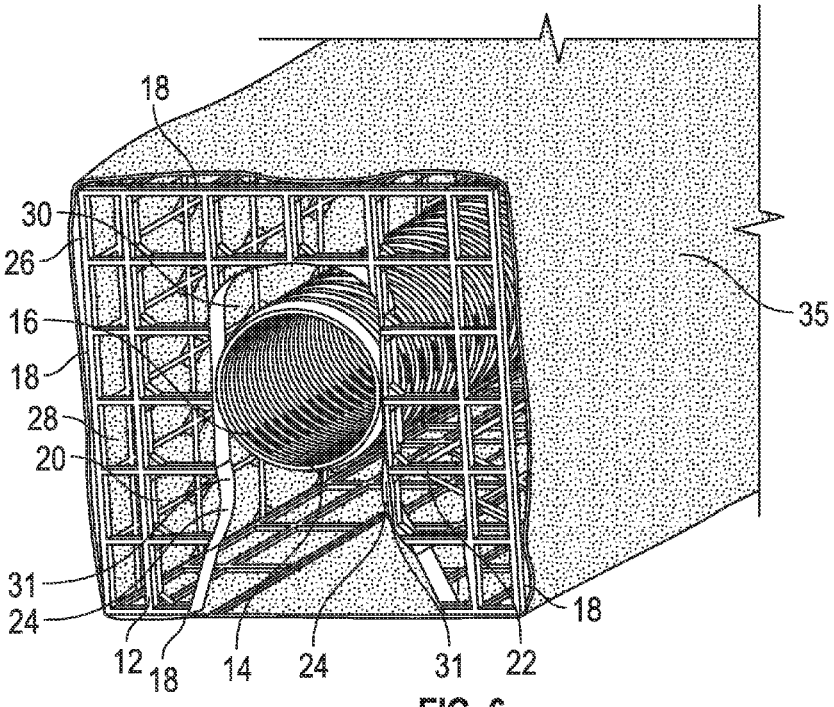
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FIG. 6

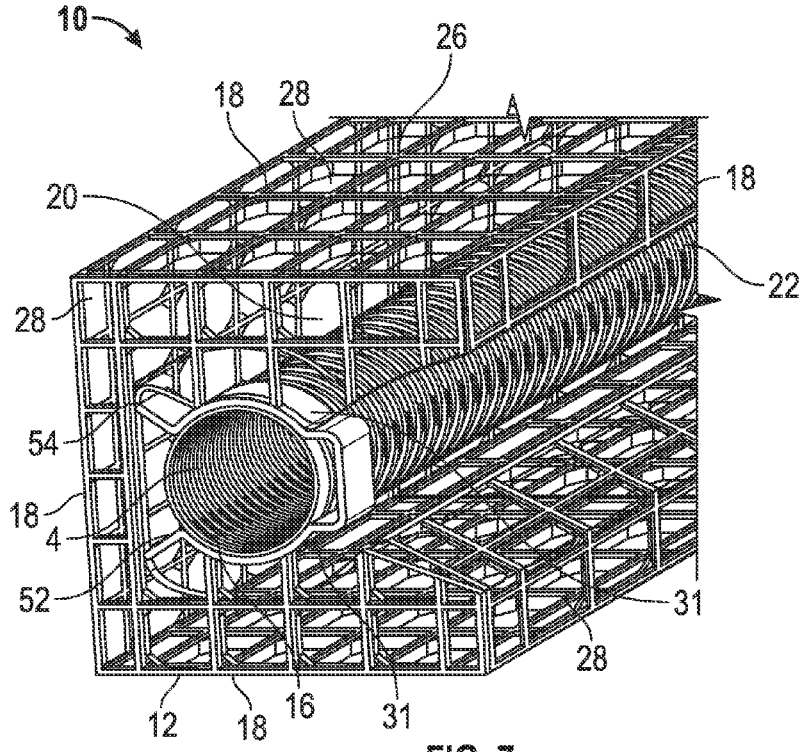
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FIG. 7

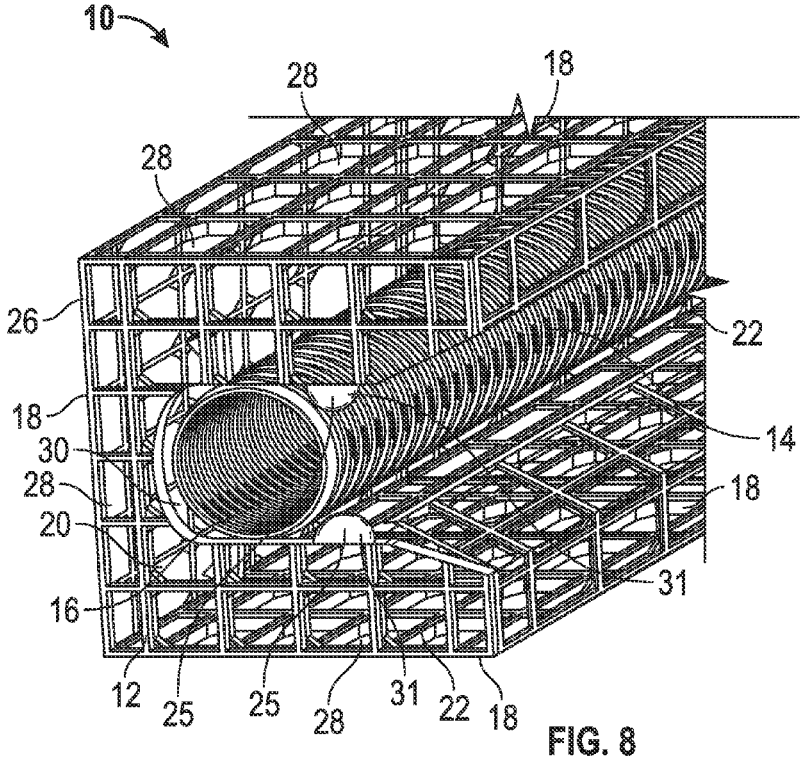
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FIG. 8

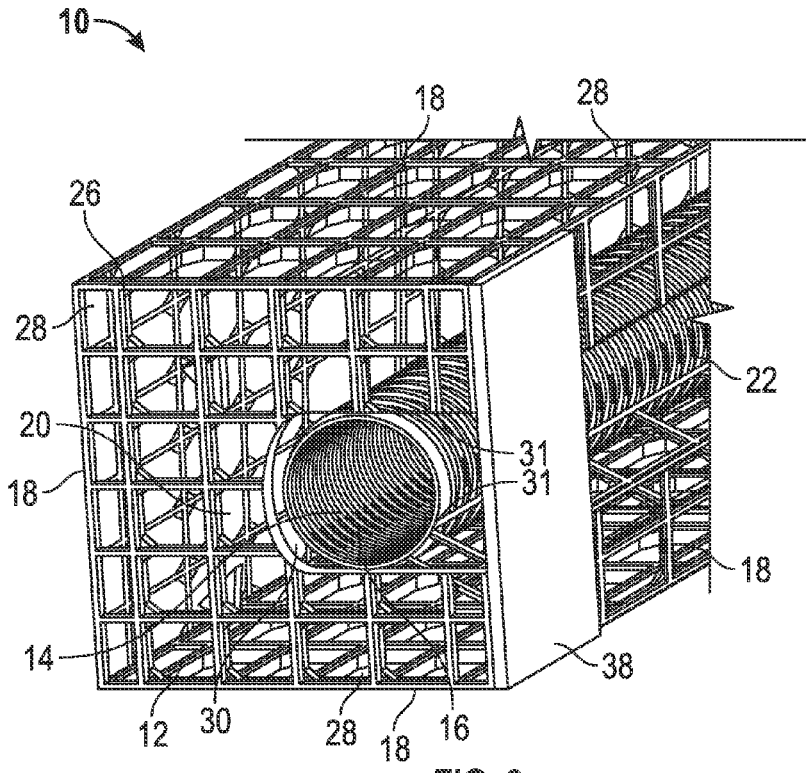
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FIG. 9

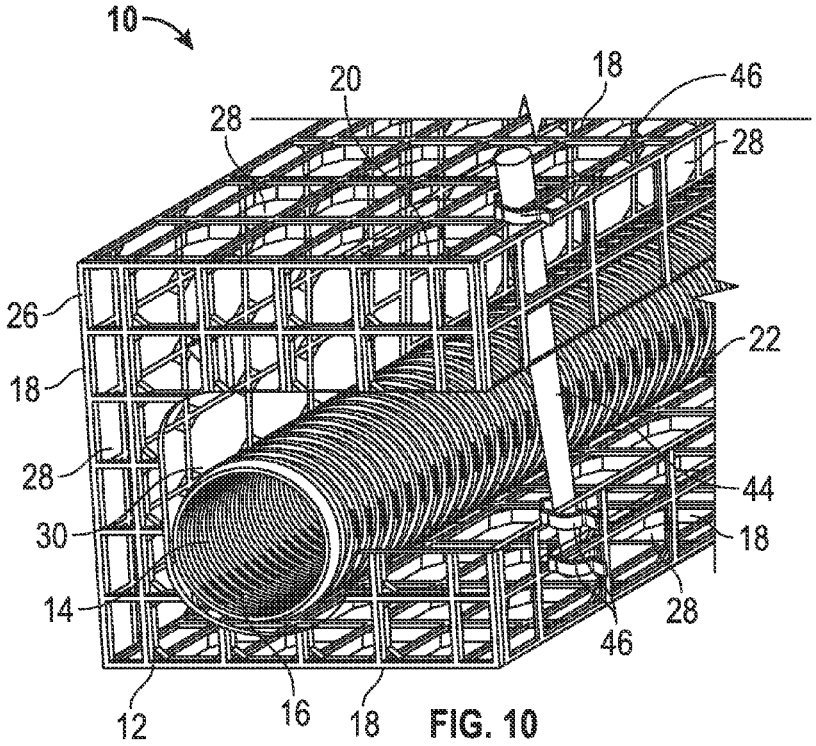
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FIG. 10

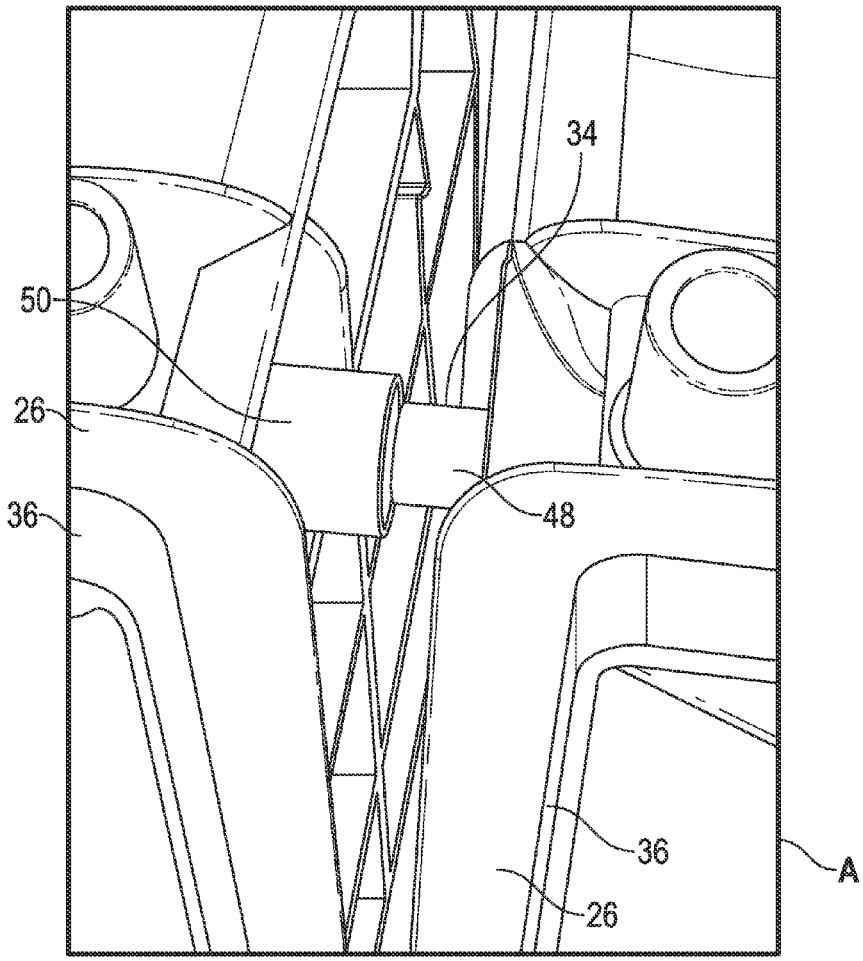

FIG. 11

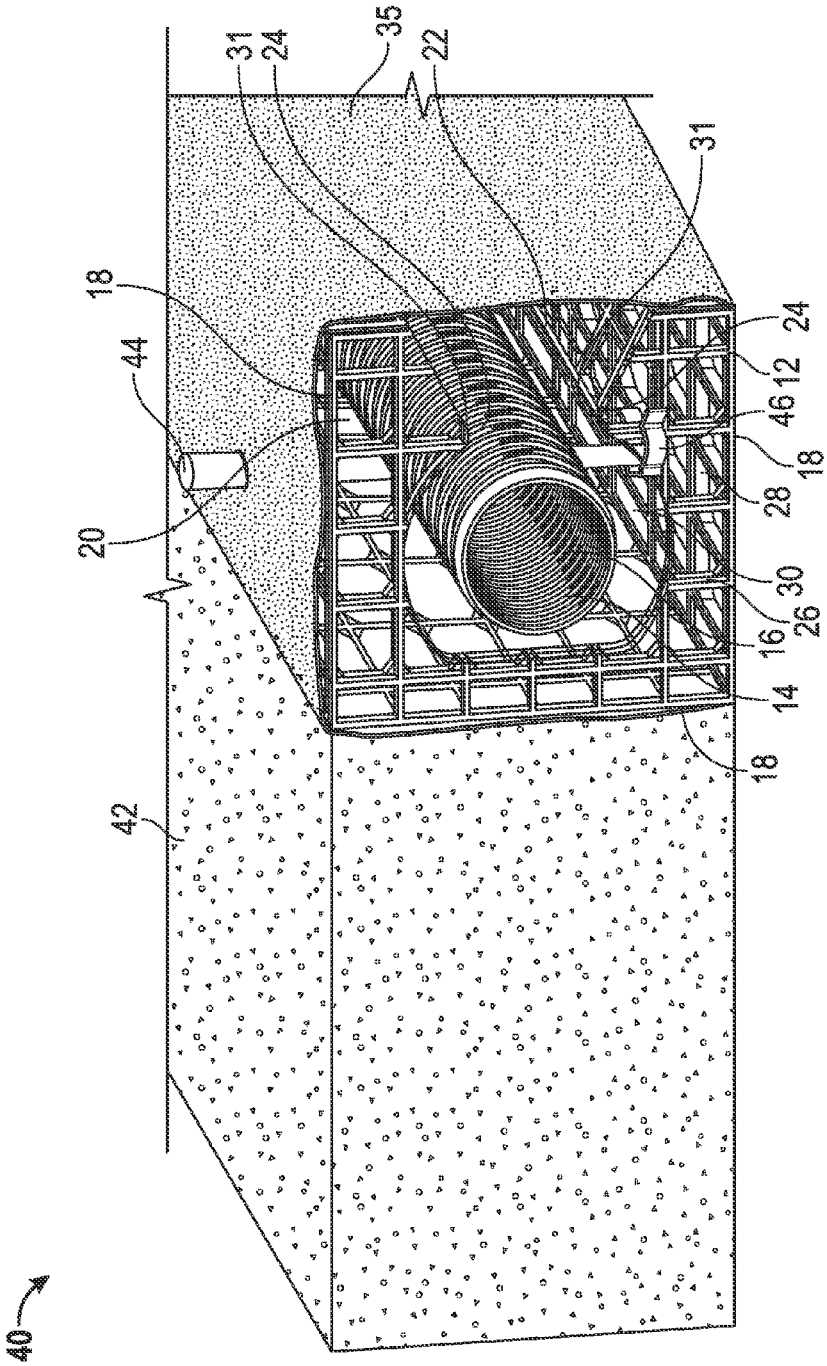

FIG. 12

AGGREGATE REPLACEMENT

BACKGROUND OF THE INVENTION

1. Technical Field

This invention relates to French drains and in particular to a device which can be used to replace the aggregate used in French drains or other water distribution systems.

2. Background Art

French drains are widely used in residential and commercial building applications to collect groundwater and distribute it away from the proximity of basements, foundations, footings, and similar surface and subterranean building structures where water may penetrate and/or damage these structures. An additional use of this technology is to deliver water into the sub-surface of the ground. For example, a French drain may be used to distribute fluid into the drain field of a residential septic system.

Various structures have been developed over the last two hundred years to accomplish this diversion of fluids. Generally, they consist of a pipe containing multiple small perforations throughout its sidewall through which water or fluid enters the pipe. The fluid then travels down the pipe to a desired location. To keep the perforations in the pipe from clogging, and to prevent dirt or other material from the surrounding substrate from entering the pipe, the pipe is laid within a bed of solid granular material that creates a porous aggregate unrestrictive to the flow of fluid, such as gravel, or a similar synthetic aggregate. Finally, a woven, coarse, landscape textile or filter fabric is used to surround and cover the aggregate to prevent the aggregate from becoming clogged with dirt or other surrounding substrate. The pipe, surrounding aggregate, and textile are typically installed within a trench which is then filled to grade level with dirt or other substrate. Rainwater or other surface water in the area seeps from the surrounding substrate through the textile where it may trickle freely through the aggregate into the pipe for removal from the area.

One significant problem with this system is the labor and expense necessary to surround the pipe with the aggregate. Also, if the aggregate is too heavy or is not placed carefully on top of the pipe, the pipe may break or collapse while the aggregate is being placed. This can cause time consuming and expensive problems.

Various inventions have been made in order to try and prevent these problems. For example, U.S. Pat. No. 5,810,509 issued to Nahlik, Jr. discloses a cell system for buried drainage pipes. These cells, however, cannot be used to form continuous French drains. Instead, there are individual cells that are spaced throughout the drainage area. These cells also do not protect the areas of pipe between the cells and therefore there may be a problem with these areas of pipe being damaged when the trench they are laid in is filled.

U.S. Pat. No. 7,191,802 issued to Koerner (hereinafter "Koerner") and U.S. Pat. No. 5,051,028 issued to Houck et al. (hereinafter "Houck"), also attempt to improve French drains by replacing the standard aggregate. They, however, do not allow the aggregate replacement and pipe to be easily assembled on site.

Instead Houck discloses units that are manufactured as one piece with sections of perforated pipe inside. Multiple units are hooked together. Therefore if a section of pipe becomes damaged, the entire unit must be replaced rather than just the pipe.

Koerner discloses a system where netting filled with aggregate is wrapped along a perforated pipe. This system takes too long to conveniently assemble on site and therefore will likely need to be preassembled. Therefore if the pipe gets damaged the entire assembly will need to be replaced rather than simply replacing the pipe.

Also, while these patents claim to protect the pipe, in reality they would provide very little protection to the pipe when the trench is being filled in with substrate.

Accordingly, what is needed is an aggregate replacement device that is light weight, easy to use, quick to install and which allows the pipe to be accessed and inserted after the aggregate replacement has been placed in the trench.

DISCLOSURE OF THE INVENTION

The aggregate replacement device, as disclosed hereafter in this application, is strong, lightweight and easy to assemble.

In particular embodiments, an aggregate replacement device includes a structure with a proximal end, a distal end, and at least one face wherein the at least one face includes a plurality of first openings. A second opening in the structure extends from the proximal end to the distal end continuing uninterrupted through at least one of the at least one faces. The second opening is configured to receive at least one pipe inserted in a radial direction of the at least one pipe.

Additional embodiments of an aggregate replacement device may include a structure having a proximal end, a distal end, and at least one face that is water permeable. The aggregate replacement device may also include an opening in the at least one outer face that extends from the proximal end to the distal end of the structure continuously. The opening may be configured to receive at least one pipe inserted in a radial direction of the at least one pipe. The opening may further include at least one pipe retainer.

Other embodiments of an aggregate replacement device may include a structure having a proximal end, a distal end, and at least two faces. The at least two faces further contain a plurality of first openings. A stake may be coupled to the structure to secure the structure in a desired position. A concrete barrier may be placed abutting at least one of the at least two faces. An second opening in the structure may extend from the proximal end of the structure to the distal end of the structure continuing uninterrupted through at least one of the at least two faces. The second opening, however, continues through a different at least one of the at least two faces than the concrete barrier abuts. The second opening may be configured to receive at least one pipe inserted in a radial direction of the at least one pipe.

The foregoing and other features and advantages of the aggregate replacement device will be apparent to those of ordinary skill in the art from the following more particular description of the invention and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will hereinafter be described in conjunction with the appended drawings where like designations denote like elements, and:

FIG. **1** is an isometric view of an aggregate replacement configured according to a first embodiment;

FIG. **2** is an isometric view of an aggregate replacement configured according to a second embodiment;

FIG. **3** is a first side view of an aggregate replacement configured according to the embodiments of FIG. **1**;

FIG. **4** is a second side view of an aggregate replacement configured according to the embodiments of FIG. **1**;

FIG. **5** is an end view of an aggregate replacement configured according to the embodiments of FIG. **1**;

FIG. **6** is an isometric view of an aggregate replacement covered by a liner configured according to a third embodiment;

FIG. **7** is an isometric view of an aggregate replacement configured according to a fourth embodiment;

FIG. **8** is an isometric view of an aggregate replacement configured according to a fifth embodiment;

FIG. **9** is an isometric view of an aggregate replacement configured according to a sixth embodiment;

FIG. **10** is an isometric view of an aggregate replacement configured according to a seventh embodiment;

FIG. **11** is a close up view of an area denoted by A in FIG. **2**; and

FIG. **12** is an isometric view of an aggregate replacement concrete form configured according to an embodiment.

DESCRIPTION OF THE INVENTION

As discussed above, embodiments of the present invention relate to an aggregate replacement device for use in French drains and the like. In particular, disclosed is an aggregate replacement device including a structure with fluid permeable surfaces, and an opening configured to receive a pipe inserted parallel to a diameter of the pipe.

When French drains or other drainage or fluid distribution systems are set up, a trench is dug in the ground in the area where the water is to be drained from. The trench is then lined with a landscape, filter fabric or other water permeable material which prevents the soil or substrate from the surrounding area from entering the trench. Aggregate may then be placed in the bottom of the trench. This aggregate is typically washed gravel or a synthetic aggregate that allows water to flow freely through. A perforated pipe is then placed on top of the aggregate. The perforated pipe could also be placed directly on the filter fabric in the bottom of the trench. The perforated pipe is then covered with additional aggregate. The top of the additional aggregate may have more filter fabric placed on it. Then top soil and plants may be placed on the filter fabric hiding the French drain underground.

FIGS. **1-6** illustrate an aggregate replacement **10** configured according to embodiments of the present invention. The aggregate replacement **10** takes the place of the washed gravel or synthetic aggregate in a French drain or other water distribution system.

The aggregate replacement **10** includes a structure **26** which is formed as an open scaffolding. The structure **26** includes a proximal end **12**, a distal end **32** and at least one face **18**. The proximal end **12** is coupled to the at least one face **18**. In the figures, the proximal end **12** is coupled at a 90 degree angle to four faces **18**. The four faces **18** illustrated are rectangular or square. It is anticipated, however, that only one face **18** could be used. This face **18** would be curved in order to form a cylindrical aggregate replacement. It is also anticipated that three faces **18** could be utilized in order to form a structure with a triangular cross section. A plurality of faces **18** greater than four could also be used to form the structure **26**. The number of faces **18** and the desired shape of the structure **26** will determine the angle at which the faces are coupled to the proximal end **12**. The four faces **18**, shown in the figures, are also coupled to each other at 90 degree angles. The angle at which the faces **18** are coupled to each other will vary depending on the number and shape of faces **18** utilized. The distal end **32** is coupled to the remaining open edges of the four faces **18**. The arrangement described and depicted in the figures results in a cube or rectangular prism shaped structure **26**. However, the structure **26** may be any type of shape desired. The at least one face **18**, proximal end **12**, and distal end **32** may also be formed in any shape desired.

In additional embodiments, the structure **26** may be curved in order to form circular, serpentine or other irregularly shaped drains.

The structure **26** forms a mostly hollow interior **20**. The mostly hollow interior **20** may contain supports or other devices necessary to strengthen the structure **26**. However, these devices should not impede the flow of water in the interior **20** of the structure **26**. The mostly hollow interior **20** of the structure **26** allows water to drain through the structure **26** just like water would drain through the washed gravel or synthetic aggregate of traditional drains.

The proximal end **12**, distal end **32** and at least one face **18** are water permeable. This is accomplished by forming at least one first opening **28** in the proximal end **12**, distal end **32** and at least one face **18**. In FIG. **1**, the proximal end **12**, distal end **32** and four faces **18** are all formed with multiple square openings **28** separated by thin structural members which help structure **26** maintain its shape while allowing fluid, typically water, to pass easily through the proximal end **12**, distal end **32** and faces **18**. FIG. **2** has multiple round openings **28** in the proximal end **12**, distal end **32** and at least one face **18**. The at least one first opening **28** may be any size or shape desired so long as the openings **28** are a size and shape that allow water to easily permeate the surfaces of the structure **26** and enter the mostly hollow interior **20**.

It alternate embodiments, the proximal end **12**, the distal end **32** of the structure **26** and at least one but not all of the faces **18** may not contain any openings **28**.

The aggregate replacement **10** may be formed as one single piece that runs the entire length of the drain or it may be formed in smaller pieces that are connected together. FIG. **2** illustrates an embodiment of an aggregate replacement **10** which is composed of multiple units **36** which are coupled together with connectors **34**. These connectors **34** may be any type of connector that holds two aggregate replacement units **36** together. FIG. **11** is a close up of section A from FIG. **2**. FIG. **11** shows a connector **34**. In this illustration, the connector is a pin **48** which slides into a receiver **50**. The pin **48** is simply a cylindrical extension from the structure **26** of the aggregate replacement **10**. The receiver **50** is an open cylindrical extension of the structure **26** of the aggregate replacement **10**. The pin and the receiver are close enough in size that by inserting the pin **48** into the receiver **50**, the units **36** are kept reasonably securely connected.

In alternate embodiments, the connector **34** may be flexible in order to allow the units **36** to be connected in a circular, serpentine, or non-linear arrangement.

In other embodiments, multiple units **36** may simply be placed adjacent each other without the use of connectors. The pipe **14** would then be inserted into the units **36**. The units **36** would be held adjacent to each other by the pipe **14**.

FIGS. **1-6** also show a second opening in a face **18** of the structure **26**. The second opening may comprise an insertion opening **22**, a pipe retainer and a pipe receiver **30**. The insertion opening **22** is created in one of the at least one faces **18** of the structure **26**. The insertion opening **22** allows a pipe **14** with perforations **16** to be inserted in a radial direction into the aggregate replacement **10**. The insertion opening **22** should be large enough to allow a pipe **14** of a desired size to be inserted into the structure **26** of the aggregate replacement **10**. The insertion opening **22** runs the entire length of one of the at least one faces **18** as shown FIG. **4** which is a side view of the aggregate replacement **10**.

FIG. **5** is a view of the proximal **12** or distal end **32** of the structure **26**. The insertion opening **22** also extends through

the proximal end **12** and the distal end **32** of the structure **26**. In the proximal end **12** and the distal end **32** of the structure, the insertion opening **22** forms a pipe receiver **30**.

The pipe receiver **30** is an opening formed in the proximal end **12** and the distal end **32** of the structure **26**. The pipe receiver **30** is slightly larger than the diameter of the pipe **14** and holds the pipe **14** when the drain is in place. The pipe receiver **30** has a mouth which connects to the insertion opening **22**.

At the mouth **31** of the pipe receiver **30**, may be a pipe retainer. The pipe retainer may comprise at least one protrusion **24**. The at least one protrusion **24** narrows the insertion opening **22** to less than the diameter of the pipe **14**. The at least one protrusion **24** may be flexible, or the pipe **14** may be slightly flexible in order to allow the pipe **14** to be forced past the at least one protrusion **24** and through the mouth **31** of the pipe receiver **30**. The at least one protrusion **24** will then hold the pipe **14** within the pipe receiver **30**.

The pipe retainer may also be simply a narrowing of the insertion opening **22** or in an alternate embodiment of the invention as shown in FIG. **8**, the pipe retainer may be tabs **25** manufactured at the mouth of a U shaped pipe receiver **30**. The tabs **25** along with the U shaped pipe receiver **30** act to hold the pipe **14** in place within the aggregate replacement **10**.

FIG. **7** illustrates an additional embodiment of the aggregate replacement **10**, where the pipe retainer uses a pipe clip **52** placed on the pipe **14**, prior to the pipe **14** being placed in the insertion opening **22**. The pipe clip **52** is then snapped into a pipe clip retainer **54** which is formed into the edge of the pipe receiver **30**. The pipe **14** is then held firmly in place in the pipe receiver **30**.

FIG. **9** illustrates yet another embodiment of the pipe retainer. In this embodiment, the pipe **14** is held in the pipe receiver **30** by a strap **38** which is coupled to the structure **26** of the aggregate replacement **10**.

In FIG. **10**, the pipe **14** is retained in place in the pipe receiver **30** by gravity. The insertion opening **22** is located slightly above the center of the pipe receiver **30**. The pipe **14** passes through the insertion opening **22** and drops into the pipe receiver **30**. The pipe **14** then stays in place because it is lower than the insertion opening **22**.

FIG. **10** also shows a pipe retainer using a stake **44** which is placed in a stake retainer **46**. The stake **44** is simply a metal or wooden stake or rigid rod that is placed inside of an opening called a stake retainer **46**. The stake **44** is then usually driven into the ground under the aggregate replacement **10**. The stake **44** serves two purposes. First, the stake **44** holds the aggregate replacement **10** in place. Second, the stake **44** prevents the pipe **14** from leaving the pipe receiver **30**.

The stake retainer **46** may be a hole in the structure which is designed to have the stake **44** placed in it, as shown in FIG. **10**. The stake retainer **46** may also be a strap which straps the stake **44** to the outside of the structure **26**. The stake retainer **46** may further be a bolt or screw which bolts or screws the stake **44** to the structure **26**. The stake retainer **46** may be any device which couples the stake **44** to the structure **26**. Coupling the stake **44** to the structure **26** may include receiving the stake **44** in an opening, physically attaching the stake **44** to the structure **26** or the like.

Once the pipe **14** is inserted into the aggregate replacement **10**, the aggregate replacement **10** is either placed in a trench lined with filter fabric or the aggregate replacement **10** is wrapped in filter fabric. FIG. **6** illustrates the aggregate replacement **10** wrapped in filter or landscape fabric **35**. The filter or landscape fabric **35** is the same type of fabric used in traditional arrangements of a French drain. The fabric **35** is a water permeable material that prevents soil, rocks, substrates or other things that might clog the perforations **16** in the pipe **14** from entering the aggregate replacement **10**.

In using the aggregate replacement **10** embodiments described above, a trench is dug where the drain or distribution system is to be placed. The trench is lined with a water permeable fabric **35** such as landscape fabric, filter fabric, water permeable material or the like. The aggregate replacement **10** is then assembled. If there is more than one unit **36**, then the units **36** may be connected together through use of the connectors **34**. The pipe **14** is then inserted through the insertion opening **22**. The pipe **14** is forced past the protrusions **24** or tabs **25** if protrusions **24** or tabs **25** are being used. The pipe **14** passes through the mouth of the pipe receiver **31** and into the pipe receiver **30**. If protrusions **24** or tabs **25** are not being used, then the pipe retainer is now engaged. The aggregate replacement **10** along with the pipe **14** already inserted is then laid on top of the fabric **35** in the trench. Typically, the aggregate replacement **10** will be placed in the trench with the insertion opening **22** positioned towards the bottom of the trench as shown in FIG. **6**. This position places the pipe **14** towards the bottom of the trench where more water can flow through the perforations **16** into the pipe **14**. The fabric **35** is then wrapped around the aggregate replacement **10** and the trench is filled in.

In alternate embodiments the aggregate replacement **10** may be wrapped in the fabric **35** prior to being placed in the trench.

The pipe **14** could also be inserted into the aggregate replacement **10** after the aggregate replacement **10** is in place in the trench.

When in use, water flows through the fabric **35** and through the openings **28** in the faces **18** of the aggregate replacement **10** structure **26**. The water then flows through the perforations **16** into the pipe **14**. The pipe **14** will typically be angled so that the water flows down the pipe **14** and to a desired location.

This process works in reverse for other water distribution systems such as those used in residential septic systems.

An additional embodiment of the aggregate replacement is illustrated in FIG. **12**. In this embodiment, the aggregate replacement **40** is formed as described above. A stake retainer **46** may also be formed in the structure **26** on the side of the pipe receiver **30** away from the insertion opening **22**. The stake **44** in this case will be used only to hold the aggregate replacement **40** in place. In alternate embodiments, a stake retainer **46** may be anything that couples the stake **44** to the structure **26**. The aggregate replacement **40** is put in position with the face **18** of the structure **26** opposite the insertion opening **22** acting as a concrete form. The face **18** of the structure **26** opposite the insertion opening **22** is covered with a concrete barrier **35** such as filter fabric, landscape fabric, screen, water permeable material, solid plastic or the like. The concrete barrier **35** may or may not be water permeable. The concrete barrier **35** may be any material that retains the concrete in place while it is curing.

Concrete **42** may then be poured, with the concrete **42** coming up against the water permeable barrier **35**. Once the concrete **42** has dried, the pipe **14** may be placed in the aggregate replacement **40** if it has not already been placed.

This arrangement allows moisture to be drained away from the concrete **42**. The moisture travels through the material **35**, passes through the aggregate replacement **40** and enters the pipe **14** through the perforations **16**. The moisture then travels down the pipe **14** and away from the concrete **42**.

Accordingly, for the exemplary purposes of this disclosure, the components defining any embodiment of the invention may be formed as one piece if it is possible for the compo-

nents to still serve their function. The components may also be composed of any of many different types of materials or combinations thereof that can readily be formed into shaped objects provided that the components selected are consistent with the intended mechanical operation of the invention. For example, the components may be formed of rubbers (synthetic and/or natural), glasses, composites such as fiberglass, carbon-fiber and/or other like materials, polymers such as plastic, polycarbonate, PVC plastic, ABS plastic, polystyrene, polypropylene, acrylic, nylon, phenolic, any combination thereof, and/or other like materials, metals, such as zinc, magnesium, titanium, copper, iron, steel, stainless steel, any combination thereof, and/or other like materials, alloys, such as aluminum, and/or other like materials, any other suitable material, and/or any combination thereof.

The embodiments and examples set forth herein were presented in order to best explain the present invention and its practical applications and to thereby enable those of ordinary skill in the art to make and use the invention. However, those of ordinary skill in the art will recognize that the foregoing description and examples have been presented for the purposes of illustration and example only. The description as set forth is not intended to be exhaustive or to limit the invention to the precise form disclosed. Many modifications and variations are possible in light of the teachings above without departing from the spirit and scope of the forthcoming claims. Accordingly, any components of the present invention indicated in the drawings or herein are given as an example of possible components and not as a limitation.

The invention claimed is:

1. An aggregate replacement device comprising:

a structure formed as an open scaffolding comprising a proximal end having a face, a distal end having a face, and at least four faces extending between said face of said proximal end and said face of said distal end, wherein said at least four faces further comprises a plurality of first openings;

wherein all of said proximal end having a face, said distal end having a face and said at least four faces are flat;

at least one second opening formed in said proximal end having a face and said distal end having a face;

wherein said at least one second opening further comprises a U shaped cross-section;

wherein said U shaped cross-section of said at least one second opening further comprises at least one protrusion for retaining said at least one pipe in said at least one second opening;

at least one pipe extending transversely through said at least one second opening; and

wherein said at least one pipe intersects said proximal end having a face and said distal end having a face at the center of said proximal end having a face and said distal end having a face.

2. The aggregate replacement device of claim **1**, further comprising at least one pipe retainer for retaining said at least one pipe in said at least one second opening.

3. The aggregate replacement device of claim **1**, further comprising at least one pipe clip and at least one pipe clip retainer.

4. The aggregate replacement device of claim **1**, further comprising a coupler for coupling multiple aggregate replacement devices together; wherein said multiple aggregate replacement devices are coupled together with said face of said proximal end of a first one of said multiple aggregate replacement devices abutting said face of said distal end of a second one of said multiple aggregate replacement devices; and wherein said at least one pipe extends continuously through said multiple aggregate replacement devices.

5. The aggregate replacement device of claim **1**, further comprising a stake retainer for receiving a stake and wherein said stake fixes the aggregate replacement device in position.

6. The aggregate replacement device of claim **5**, wherein a barrier is positioned normal to said at least one face.

7. An aggregate replacement device comprising:

a structure formed as an open scaffolding comprising a proximal end, a distal end, and at least one flat face wherein said at least one flat face is permeable to water;

an opening bisecting said at least one flat face, wherein said opening extends from said proximal end to said distal end continuously;

wherein said opening is configured to receive at least one pipe inserted in a radial direction of said at least one pipe;

wherein said opening further comprises at least one pipe retainer; and

wherein said at least one pipe retainer further comprises at least one pipe clip coupled to said at least one pipe and at least one pipe clip receiver, wherein said at least one pipe clip is received by said at least one pipe clip receiver.

8. The aggregate replacement device of claim **7**, wherein one said at least one pipe retainer is formed in said proximal end and one said at least one pipe retainer is formed in said distal end of said structure.

9. The aggregate replacement device of claim **7**, wherein said at least one pipe retainer further comprises a U shaped opening with at least one protrusion extending inward in said U shaped opening.

10. The aggregate replacement device of claim **7**, wherein said at least one pipe retainer further comprises a semicircular chamber sized to hold said at least one pipe, wherein said semicircular chamber is communicatively connected to said opening and wherein said opening is narrower than a diameter of said at least one pipe.

11. An aggregate replacement device comprising:

a structure comprising a proximal end having a face, a distal end having a face, and at least four flat faces extending between said face of said proximal end and said face of said distal end, wherein said at least four flat faces further comprise a plurality of first openings and each face of the said at least four flat faces are transverse to an adjacent face of the at least four flat faces;

a stake coupled to said structure, wherein said stake secures said structure in position;

a barrier abutting at least one of said at least four flat faces;

at least two second openings in said structure, wherein one of said at least two second openings is in said face of said proximal end of said structure and one of said at least two second openings is in said face of said distal end of said structure;

wherein said at least two second openings are configured to receive at least one pipe;

at least one pipe retainer for retaining said at least one pipe in said at least two second openings; and

wherein said at least one pipe retainer further comprises a semicircular chamber sized to hold said at least one pipe, wherein said semicircular chamber is communicatively connected to said at least two second openings.

12. The aggregate replacement device of claim **11**, wherein said stake is coupled to said structure by a stake retainer.

13. The aggregate replacement device of claim **11**, further comprising at least one coupler for coupling multiple aggregate replacement devices together, wherein said face of said distal end of a first of said multiple aggregate replacement

devices abuts said face of said proximal end of a second of said multiple aggregate replacement devices when said multiple aggregate replacement devices are coupled together.

14. The aggregate replacement device of claim **11**, wherein said at least two second openings further comprise a U shaped opening with at least one protrusion extending inward in said U shaped opening.

15. The aggregate replacement device of claim **11**, wherein said aggregate replacement device may be used as a form for concrete.

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